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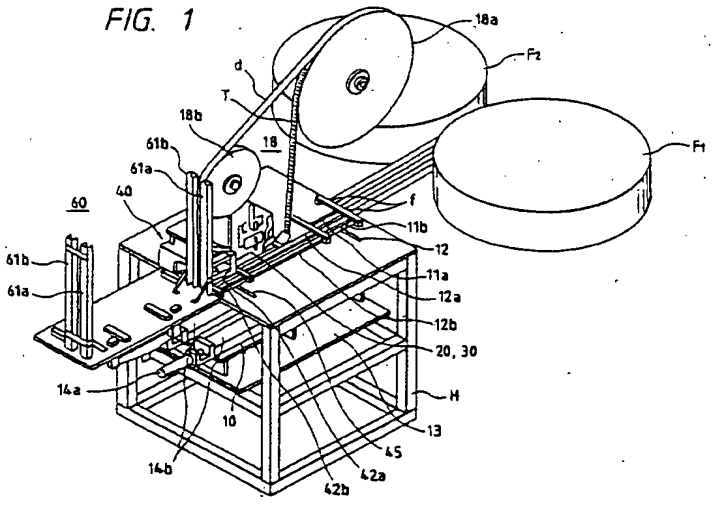
(54) Device for mounting connector terminals used for wire harness

(57) Disclosed is a device for automatically mounting a crimp-style terminal on a connector housing which can have one or more vacant cavities. The mounting device is to be applied in production in which connectors can have varying numbers of terminals. Housings are accurately fed by a plurality of parts feeders and guides. Empty housings and housings with inserted terminals are held, respectively, by separate magazines. Terminals are individually cut off from a terminal hoop and individually set into insertion positions in front of a housing. After all terminals have been set, the terminals are inserted into the cavities all at once.

FIG. 1



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Description

BACKGROUND OF THE INVENTION

1. Field of Invention

The present invention relates to a device for mounting terminals on a connector housing of a wire harness used for an automobile.

2. Description of Related Art

An example of a connector C used for a wire harness is shown in Figs. 20(a) and 20(b). This connector C is composed of an upper housing C_1 and a lower housing C_2. As shown in Fig. 20(a), crimp-style terminals t are mounted on (inserted into) predetermined cavities b of the housings C_1, C_2, which will collectively be referred to as a connector C hereinafter, and the crimp-style terminals t are connected (crimped) with electrical wires a that are part of a wire harness. As shown in Fig. 20(b), the upper housing C_1 is engaged with the lower housing C_2 when the cover C'_1 is rotated to a closed position.

When the terminals t are automatically mounted on collector C, it is common that the terminals t are cut off from a terminal hoop T and individually inserted into the cavities b as shown in Fig. 20(a).

In the conventional example of an automatic mounting device for automatically mounting the terminals t on a connector C, the terminals t, the number of which is predetermined corresponding to the number of the cavities of connector C, are cut off all at once from the terminal hoop T, and the terminals t are inserted into the corresponding cavities b all at once. Although productivity of this automatic mounting device is high, it is impossible to apply this mounting device to different connectors C having a different number of cavities b (the number of poles). Consequently, in production, the conventional mounting device can be applied only to a limited number of terminal configurations.

Recently, the number of different types of connectors that are produced has tended to increase while the number of connectors of the same type that are produced has tended to decrease. Therefore, when the above conventional mounting device is used, production costs will likely be greater than with use of the proposed device.

SUMMARY OF THE INVENTION

It is therefore an object of the present invention to provide a mounting device to be applied to production in which an increased number of different types of connectors is used compared to the number of connectors of the same type.

In accordance with the present invention, a device for mounting connector terminals used for a wire harness is disclosed, comprising: a terminal cutting means for individually cutting each terminal from a terminal hoop; a setting means for individually setting the cut terminal at a inserting position in front of a terminal cavity of a connector housing; an inserting means for inserting all terminals into the cavities after the terminals have been set at the inserting positions in front of all terminal cavities of the connector housing; and an accommodating means for accommodating the connector housings into which the terminals have been inserted, wherein the above means are successively arranged along a conveyance passage of a conveyance means for linearly conveying the connector housings while the conveyance means holds the connector housings.

The cut terminals are successively set at inserting positions in front of the corresponding cavities of the connector housing except for cavities (vacant cavities) into which no terminals are inserted (mounted). After all terminals are set, they are inserted into the connector all at once. When the terminals are individually cut off and set in the above manner, it is possible to apply the above mounting device to diverse connector housings having differing numbers of cavities (poles). Further, it is possible to avoid a case in which terminals are unnecessarily inserted into vacant cavities. When all terminals are inserted into the connector all at once, the working efficiency can be enhanced.

Fixed cutting and setting positions are established along the conveyance passage. After the terminal setting means places a cut terminal at an inserting position, the conveyance means conveys the connector housing at intervals defined by the distance between adjacent terminal cavities so as to allow the housing to cooperate with the fixed cutting and setting positions. Therefore, even if the connector has vacant cavities, the terminals can be easily mounted on the connector.

The conveyance means includes two chuck mechanisms for holding the connector housings in a predetermined way. The housings are fed to the chuck mechanisms one by one. These chuck mechanisms are arranged on both sides of the conveyance passage along the conveyance passage so that the chucks can be retracted from the conveyance passage.

In accordance with the invention, a chuck which conveys a connector housing is moved in the conveyance passage and a vacant chuck is moved in a retracting passage, so that the interference between both chucks can be avoided. When both chuck mechanisms are made to alternatively participate in a conveyance action, the production operation can be continuously conducted without disturbing the cycle of cutting, setting and inserting the terminals.

The chuck mechanism of the conveyance means is capable of moving along the conveyance passage when the chuck mechanism is attached to a ball and screw device that is driven by a servo motor. The above arrangement allows accurate movement of the chuck mechanism, and therefore, causes the connector hous-

ing to be conveyed with great accuracy.

The connector housings are fed to the conveyance means by a plurality of parts feeders. Guides for moving the connector housings accommodated in the parts feeders into a predetermined position are arranged between the parts feeders and the connector housing feed position. Each guide corresponds to a respective parts feeder, and each guide can selectively correspond to the conveyance passage.

This arrangement provides for a predetermined connector housing to be accommodated in each parts feeder. After a parts feeder is selected, a connector housing, stabilized by corresponding guides, is conveyed in a stable manner so that a plurality of terminals can be accurately mounted onto the housing.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a perspective view of an embodiment of the invention;

Fig. 2 is a plan view of an embodiment of the invention;

Fig. 3 is a front view of a connector housing conveying machine in an embodiment of the invention;

Fig. 4 is a partially cutaway enlarged left side view of the connector housing conveying machine;

Fig. 5 is a plan view of the connector housing conveying machine;

Fig. 6 is an enlarged plan view showing a chuck section of the connector housing conveying machine;

Fig. 7 is a front view of a terminal cutter of an embodiment of the invention;

Fig. 8 is a plan view of the terminal cutter;

Fig. 9 is a left side view of the terminal cutter;

Fig. 10 is an enlarged cross-sectional view showing a primary portion of the terminal cutter;

Fig. 11 is a exploded perspective view showing a primary portion of the terminal cutter;

Fig. 12 is a front view of a terminal inserting machine of an embodiment of the invention;

Fig. 13 is a left side view of the terminal inserting machine;

Fig. 14 is a plan view of the terminal inserting machine;

Fig. 15 is an enlarged cross-sectional view of a primary portion of the terminal inserting machine;

Fig. 16 is a front view of a connector housing accommodating machine of an embodiment of the invention;

Fig. 17 is a partially cutaway right side view of the connector housing accommodating machine;

Fig. 18 is an enlarged view of a primary portion of the connector housing accommodating machine;

Figs. 19(a) and 19(b) show a schematic illustration of a state of the connector housing accommodating machine accommodating magazines; and

Figs. 20(a) and 20(b) show a perspective view of a connector housing.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

In a preferred embodiment of the invention, the crimp-style terminal t is mounted on a connector housing C (C_1, C_2), such as that shown in Figs. 20(a) and 20(b). As shown in Figs. 1 and 2, a device for mounting connector terminals in the preferred embodiment of the invention includes: a feeding and conveying machine 10 for conveying connector housings C; a terminal feeding machine 18; a terminal cutter 20 having means for individually setting a terminal cutting means and a terminal t to be cut at an inserting position in front of the terminal cavity b of the connector housing C; a terminal inserting machine 40 having means for inserting the terminal t into the cavity b; and an accommodating machine 60 having means for accommodating the connector housing C into which the terminal t has been inserted. The terminal feeding machine 18 and other portions of the device for mounting connector terminals are arranged on a machine frame H along the conveyance passage c of the feeding and conveying machine 10.

First, the feeding and conveying machine 10 for feeding and conveying connector housings C will be explained as follows. As shown in Figs. 1 and 2, there are provided parts feeders F_1 and F_2, in which the respective housings C_1 and C_2 are accommodated, on both sides of the housing conveying passage c. Both feeders F_1 and F_2 can be moved in a longitudinal direction by a mechanism not shown in the drawing. Therefore, the feed port f of each feeder selectively coincides with the conveying passage c. That is, one of the housings C_1 and C_2 is selectively sent out from the parts feeders F_1 and F_2. In the drawing, a housing C_1 is conveyed.

At the right end on the upper surface of the machine frame H, there are provided two guide rails 11a, 11b in such a manner that they can be simultaneously moved in the longitudinal direction. These guide rails 11a, 11b are selectively positioned above the conveyance passage c by the action of an air cylinder 12. Sections of these guide rails 11a, 11b are formed into a shape by which the conveyance position of the connector housings C_1 and C_2 can be corrected. That is, the guide rails 11a and 11b are formed so that the connector housings C_1 and C_2 are held in a desired position. The guide rails 11a and 11b can have a configuration similar to the portions g shown in Figs. 19(a) and 19(b). Housings C_1 and C_2 sent from the feeders F_1 and F_2 are fed to the conveyance passage c while the housings are maintained in a predetermined position. The guide rail 11a corresponds to the housing C_1, and the guide rail 11b corresponds to the housing C_2.

The conveyance passage c is composed of guides 12a, 12b provided in the base frame H in the transverse direction as shown in Fig. 10. Housings C_1 and C_2 are

moved between these guides 12a, 12b while being guided by the guides 11a, 11b in a predetermined position. A movement of the housings C_1 and C_2 is performed by the feeding and conveying machine 10.

As shown in Figs. 3 to 6, the feeding and conveying machine 10 is composed as follows. There is provided a base 13 in the middle of the machine frame H, and this base 13 extends in the transverse direction over all length of the machine frame H. On the base 13, there are provided two sets of ball and screw devices 14b, 14b driven by servo motors 14a, 14a, wherein these ball and screw devices 14b, 14b are arranged on both sides of the conveyance passage c. Moving tables 14c, 14c each have a chuck mechanism respectively attached to end caps of the ball and screw devices 14b, 14b. Accordingly, when the ball and screw device 14b is rotated by the servo motor 14a, the chuck mechanism is moved in the transverse direction with high accuracy. This movement of the chuck mechanism is made in accordance with the conveyance interval of cutting and inserting a terminal, which will be described later.

The chuck mechanism is composed as follows. A pair of moving bodies 16b having a chuck claw 16a are arranged on a chuck table 15 in such a manner that the moving bodies 16b can be freely moved in the transverse direction being guided by the guides 16c. The moving body 16b is engaged with a pinion 15 of a rack 16d. When this pinion 15a is rotated by a rotary actuator 15b, the chuck claw 16a comes into contact with the housing C. In this way, the housing C can be held by the chuck claws 16a. When these chuck claws 16a, 16a come into contact with the housing C so as to hold it, the holding distance between both chuck claws 16a to hold the housing C is not limited. Therefore, it is possible to hold housings C of various sizes, that is, it is possible to hold various housings C, that have different numbers of poles. The reason why there are provided two sets of chucks on one chuck table 15 is that this mechanism holds both housings C_1 and C_2.

The chuck table 15 is mounted on the moving table 14c via the base plate 14d, air sliding table 14e, plate 15c and air sliding table 15d. In this case, the air sliding table 14e is fixed to the moving table 14c via the base plate 14d, and the plate 15c is fixed to the air sliding table 14e, and the air sliding table 15d is fixed to the plate 15c. Both air sliding tables 14e, 15d are composed in such a manner that sheet-shaped members, which are opposed to each other, are extended and retracted when compressed air is sucked and exhausted (shown by reference numerals 14e', 14e' in Fig. 4). Therefore, when the air sliding tables 14e, 15d are extended and retracted, the chuck table 15 can be moved into one of two states, as shown in Fig. 4. One is a state (conveying state) in which the chuck claw 16a is located at a position in the conveyance passage c where the chuck claw 16a can hold the housing C, and the other is a state (retracting state) in which the chuck claw 16a is separated from the conveyance passage c and retracted backward. Accordingly, as shown in Fig. 5, it is possible for these two sets of chuck mechanisms to convey the housings C alternately in such a manner that one chuck mechanism conveys one housing C and the other chuck mechanism returns to the start point to start conveyance of another housing C. Thus, it becomes possible to continuously insert the terminals t into connector housings C. In the drawing, reference numeral 17 is a runner flexible tube for supplying compressed air to the rotary actuator 15b and air sliding tables 14e, 15d.

The terminal feeding machine 18 is composed of a reel 18a around which the terminal hoop T is wound, and a winding reel 18b for winding paper d which is interposed between the winding layers of the terminal hoop T. Both reels 18a, 18b are supported by the machine frame H via the arm 18c. After paper d has been peeled off, the terminal hoop T (terminal band) is introduced from the reel 18a to the terminal cutter 20.

As shown in Fig. 10, the guides 12a, 12b have guide plates 19a, 19b, 19c directly attached to the guides 12a, 12b to guide the terminal band T. The guide plates 19a, 19b and 19c can also be attached so that some clearance is provided between the guide plates 19a, 19b and 19c and the guides 12a and 12b. The terminal band T is introduced into the passage 19 formed by these guide plates 19a, 19b, 19c via the guide plate 19d. At this time, most of the terminals t are guided while the intermediate guide plate 19b is moved and the outer guide plate 19a guides an end portion of the terminal t and the inner guide plate 19c guides a band portion t' (shown in Fig. 10).

As shown in Figs. 7 to 11, the terminal cutter 20 is composed as follows. There is provided a moving body 22 on a base plate 21 which is perpendicularly arranged on the machine frame H. This moving body 22 can be freely moved upward and downward via a groove 22a and protrusion 22b. A hook-shaped clamp 23a is fixed to this moving body 22. A crank 23b is rotatably connected with the clamp 23a. The crank 23b is connected with a rotary plate 23c in such a manner that the crank 23b can be eccentrically rotated with respect to the rotary plate 23c.

The rotary plate 23c is fixed to a shaft 23e rotated by a motor 23d having a clutch brake, via pulleys 23f and a belt 23g. When the rotary plate 23c is rotated by the motor 23d, the moving body 22 is moved upward and downward via the crank 23b and clamp 23a. The upper and the lower limit of the movement of the moving body 22 are detected by the cooperation of the detection disks 24a, 24b fixed to the shaft 23e with the photo-micro-switches 25a, 25b, 25c. In this case, the detection disk 24a and the photo-micro-switch 25a are used for detecting the upper limit, and the detection disk 24b and the photo-micro-switch 25b are used for starting the feed of the terminal t, and the detection disk 24c and the photo-micro-switch 25c are used for detecting the lower limit.

There is provided an arm 26 on the side of the mov-

ing body 22. A sliding pin 26a protrudes from this arm 26. This sliding pin 26a is engaged with a long hole 27a, which is formed on an oscillating plate 27 capable of freely oscillating with respect to the base plate 21, via an idler. Therefore, in accordance with the movement of the moving body 22 which is moved upward and downward, the sliding pin 26a moves in the long hole 27a, so that the oscillating plate 27 oscillates between a state shown by a solid line in Fig. 7 to a state shown by a dashed line in Fig. 7. At the lower end of the oscillating plate 27, there is provided a feeding claw 28, the front end portion of which is biased downward by the action of a spring not shown in the drawing. When the feeding claw 28 is moved from the solid line state to the dashed line state by the oscillation of the oscillating plate 27, and further when the feeding claw 28 is moved from the dashed line state to the solid line state, the terminal band T is fed forward at the intervals of the terminals t.

The terminal band T introduced by the above guide plates 19a, 19b, 19c is sent forward while an upper surface of the terminal band T is restricted by a pushing plate 19e. On the other hand, an upper surface portion of the inner guide plate 19c which covers the band portion t' of the terminal band T is formed into an inclined surface from the middle portion, so that the upper surface portion of the inner guide plate 19c is missing from the middle portion. This missing portion corresponds to an area where the feeding claw 28 moves. Therefore, in accordance with the aforementioned movement, the feeding claw 28 ascends and descends the inclined surface 19c' and then enters the missing portion. Then, the feeding claw 28 engages with a feeding hole e formed in the band section t' (shown in Fig. 20), and the terminal band T is fed by one pitch of the holes e. Accordingly, when the moving body 22 is once moved upward and downward, the terminal band T is fed by one pitch.

The above moving body 22 includes a means 30 for cutting the terminal t and setting it in the connector housing C. That is, a base plate 31 is fixed to the moving body 22, and a groove 32 is formed on the front surface of the base plate 31 in the upward and downward direction. A pushing member 33 slidably engages with the groove 32 and is biased downward by the action of a spring 33a. This pushing member 33 comes into contact with a protrusion 32a at the lower end of the groove 32, so that the pushing member 33 can not extend from the base plate 31 more than a predetermined amount (shown in Fig. 10). Reference numeral 33b shown in the drawing is a spring presser.

Attached to the front surface of the base plate 31 is a cutting blade 34 for cutting off the terminal t. On the front surface of the cutting blade 34, there is provided a terminal presser 35. When the moving body 22 is lowered, as shown by the dashed line in Fig. 10, the pushing member 33 contacts the band section t', and then the cutting blade 34 and the terminal presser 35 are lowered, so that the terminal t' is cut off from the band section t', and at the same time, pushed downward to an inserting position in front of the cavity b of the connector housing C, so that the terminal t is engaged with the cavity b. After the completion of engagement, the connector housing C is moved forward at the interval of the cavity b by the feeding and conveying machine 10. On the other hand, the moving body 22 is elevated, and the terminal t is set at an inserting position in front of the next cavity b. At this time, when there is a cavity b into which the terminal t is not inserted, the connector housing C is moved forward by the pitch of a vacant cavity b. That is, it is possible to obtain a connector having the vacant cavity b.

On the left side of the moving body 22, there is provided a cutting blade 36 for cutting off the band section t'. When the band section t' is moved to a position below this cutting blade 36, it is cut by the blade 36 when the blade 36 is lowered. The chip generated by this cutting operation is removed by a suction hose 37. After the predetermined terminals t have been set in the housing C_1, the housing C_1 is sent to the successive terminal inserting machine 40.

As shown in Figs. 12 to 15, this terminal inserting machine 40 is composed as follows. There is provided a base frame 41 in the machine frame H. On the front side of this base frame 41, there are provided guide rails 42a, 42b, the construction of which is the same as that of the guide rails 11a, 11b described before. Both end portions of the guide rails 42a, 42b are supported by the members 43. The guide rails 42a, 42b are moved in the longitudinal direction by the air cylinder 45 via the guide 44a and slider 44b which are fixed to the base plate 41, so that the guide rails 42a, 42b are alternately positioned in the conveyance passage c.

An air cylinder 47 is fixed to the base frame 41, and an elevating plate 49 is fixed to the piston rod of this cylinder 47 via a floating joint 48a. This elevating plate 49 is maintained to be horizontal with respect to the base frame 41 via the elevating shaft 49a and bearing 49b. This elevating plate 49 can be freely elevated while it is maintained to be horizontal. That is, the elevating plate 49 is elevated by the cylinder 47.

The elevating plate 49 is provided with an air cylinder 50. A piston rod of the air cylinder 50 is attached to the inserting blades 51a, 51b which are arranged in the transverse direction (shown in Fig. 12). The inserting blades 51a, 51b are composed in such a manner that comb teeth arranged at the lower ends of the inserting blades 51a, 51b are opposed to a groove of the cavity b of the housing C. The inserting blades 51a, 51b are lowered from a state shown by a solid line to a state shown by a dashed line in Fig. 13 when the elevating plate 49 is lowered by the cylinder 47, and the inserting blades 51a, 51b are pushed forward by the cylinder 50. Terminals t which have been set at inserting positions in front of the cavities b of the housing C are inserted and mounted in the cavities b. The two inserting blades 51a, 51b correspond to both housings C_1 and C_2.

On the front surface of the base frame 41, there is

provided an arm 52 for transferring the housing C after the terminals have been mounted, wherein the arm 52 for transferring the housing C is arranged via the air sliding table 53 and the horizontal moving plate 54 in such a manner that it can be freely moved in the transverse direction. The horizontal moving plate 54 is moved while the sliding member 54b is engaged with the groove 54a of the base frame 41. The air sliding table 53 is positioned in the conveyance passage c when a lower end of the arm 52 is lowered from a retracting position (shown by a solid line in Fig. 15) to a state shown by a dashed line.

A pin 55 arranged at an upper end of the horizontal moving body 54 is engaged with a yoke arm 57 rotated by a rotary actuator 56 arranged on the base frame 41. When the arm 57 is rotated by the rotary actuator 56, the feeding arm 52 is moved in the transverse direction from a state shown by a solid line to a state shown by a dashed line as shown in Fig. 14. When the feeding arm 52 lower end portion is located above the conveyance passage c, the housing C in which the terminals t have already been mounted is transferred by the arm 52 to the accommodating machine 60.

As shown in Figs. 16 to 18, the accommodating machine 60 is composed as follows. There is provided a base plate 69 fixed to the machine frame H via jigs 68. On the base plate 69, there are provided two rows of holders 61a, 62b, the sections of which are formed into a C-shape, wherein the inside of the holders 61a, 62b are opposed to each other. One row of the holders are used as an accommodating section for accommodating magazines G of the housings C in which the terminals are mounted, and the other row of the holders are used as an accommodating section for accommodating vacant magazines G'. As shown in Fig. 19, the magazines G, G' respectively have recess portions g corresponding to the profiles (postures) of the housings C_1, C_2. In the same manner as described above, the housings C in which the terminals have already been mounted are successively fed from the right end by the feeding arm 52.

After the housing C has been sent to the left end, the magazine G is pushed upward by a pushing member 63 of the air sliding table 62. At this time, the magazine G opens the engaging claw 64 at the lower end of one holder 61a. After the magazine G has passed through the engaging claw 64, the engaging claw 64 returns to the initial position, so that the magazine G is held in the holder 61a. Magazines G are successively accommodated in one holder 61a.

In the base frame 41 on the side of the other holder 61b, there is provided an arm 66 oscillated by the air cylinder 65. This arm 66 is engaged with a pin 67a of the pushing body 67. As shown in Fig. 17, when the arm 66 is oscillated, the pushing body 67 slides in the longitudinal direction, so that the vacant magazine G' in the other holder 61b is moved to a position below one holder 61a, that is, the vacant magazine G' in the other holder 61b is moved to the conveyance passage c. In this way, the vacant magazines G' are successively fed to the conveyance passage c.

Claims

1. A device for mounting connector terminals used for a wire harness comprising:

   a terminal cutting means for individually cutting each terminal from a terminal hoop;
   a setting means for individually setting a cut terminal at an inserting position in front of a terminal cavity of a connector housing;
   an inserting means for inserting all terminals into the cavities after the terminals have been set at the inserting positions in front of all terminal cavities of the connector housing; and
   an accommodating means for accommodating the connector housings into which the terminals have been inserted, wherein the above means are successively arranged along a conveyance passage of a conveyance means for linearly conveying the connector housings while the conveyance means hold the connector housings.

2. The device for mounting connector terminals used for a wire harness according to claim 1, wherein the terminal setting means pushes down the cut terminal to an inserting position, and the conveyance means is capable of conveying the connector housing at regular intervals of the terminal cavities of the connector housing so that a front position of the terminal cavity of the connector is positioned at a point where the terminal is pushed down.

3. The device for mounting connector terminals used for a wire harness according to claim 2, wherein the conveyance means includes two chuck mechanisms for holding the connector housings, which are fed to the chuck mechanisms one by one in predetermined position, the chuck mechanisms being arranged on both sides of a conveyance passage so that the chucks can be retracted from the conveyance passage.

4. The device for mounting connector terminals used for a wire harness according to claim 3, wherein the chuck mechanism of the conveyance means is capable of moving along the conveyance passage when the chuck mechanism is attached to a ball and screw device driven by a servo motor.

5. The device for mounting connector terminals used for a wire harness according to claim 4, wherein the connector housings are fed to the conveyance means by a plurality of parts feeders, and guides for

moving the connector housings accommodated in the parts feeders in a predetermined position are arranged between the parts feeders and a connector housing feed position, wherein each guide corresponds to each parts feeder, and each guide can selectively correspond to the conveyance passage.

6. The device for mounting connector terminals used for a wire harness according to claim 2, wherein the connector housings are fed to the conveyance means by a plurality of parts feeders, and guides for moving the connector housings accommodated in the parts feeders in a predetermined position are arranged between the parts feeders and a connector housing feed position, wherein each guide corresponds to each parts feeder, and each guide can selectively correspond to the conveyance passage.

7. The device for mounting connector terminals used for a wire harness according to claim 1, wherein the conveyance means includes two chuck mechanisms for holding the connector housings, which are fed to the chuck mechanisms one by one in a predetermined position, the chuck mechanisms being arranged on both sides of a conveyance passage so that the chucks can be retracted from the conveyance passage.

8. The device for mounting connector terminals used for a wire harness according to claim 1, wherein the connector housings are fed to the conveyance means by a plurality of parts feeders, and guides for moving the connector housings accommodated in the parts feeders in a predetermined position are arranged between the parts feeders and a connector housing feed position, wherein each guide corresponds to each parts feeder, and each guide can selectively correspond to the conveyance passage.

FIG. 1

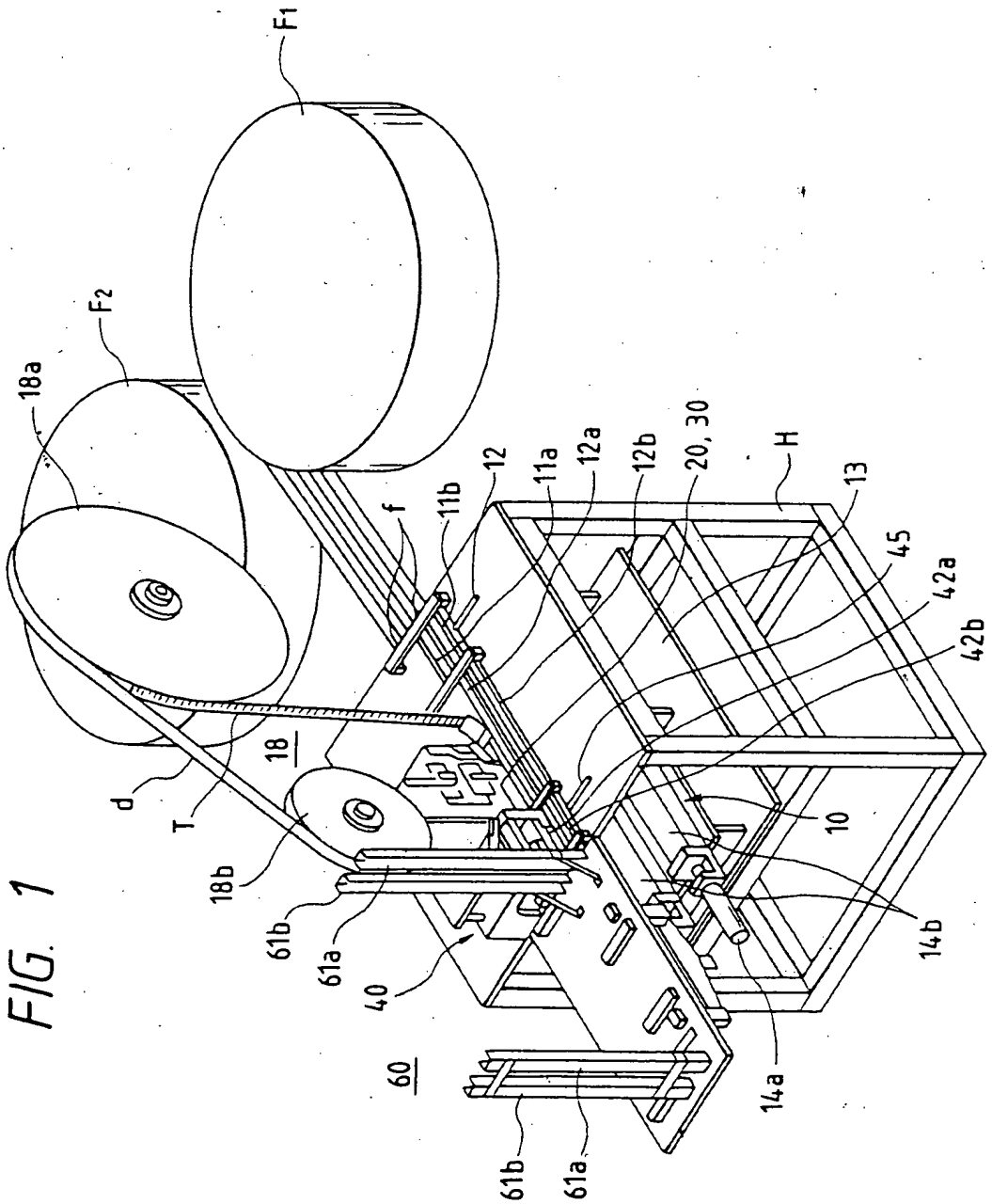
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FIG. 2

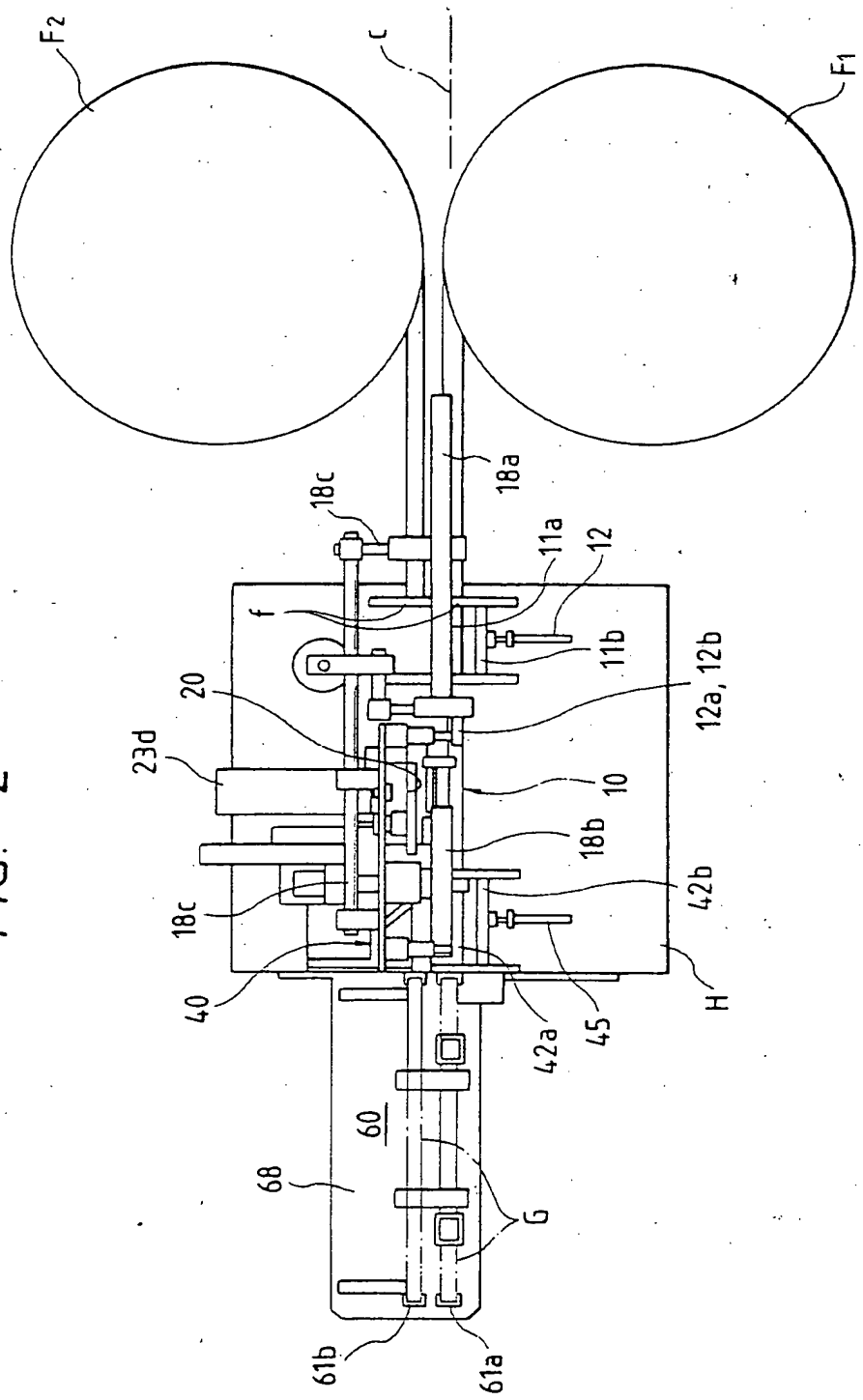
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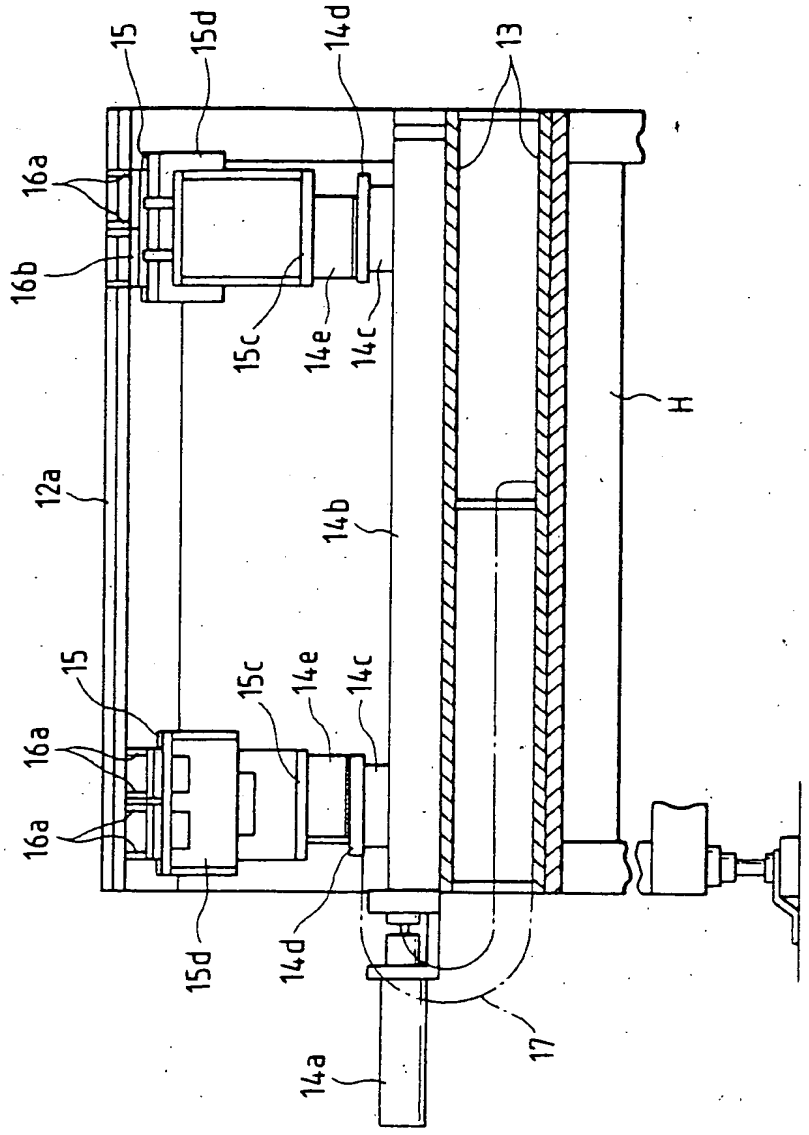
FIG. 3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14a

FIG. 4

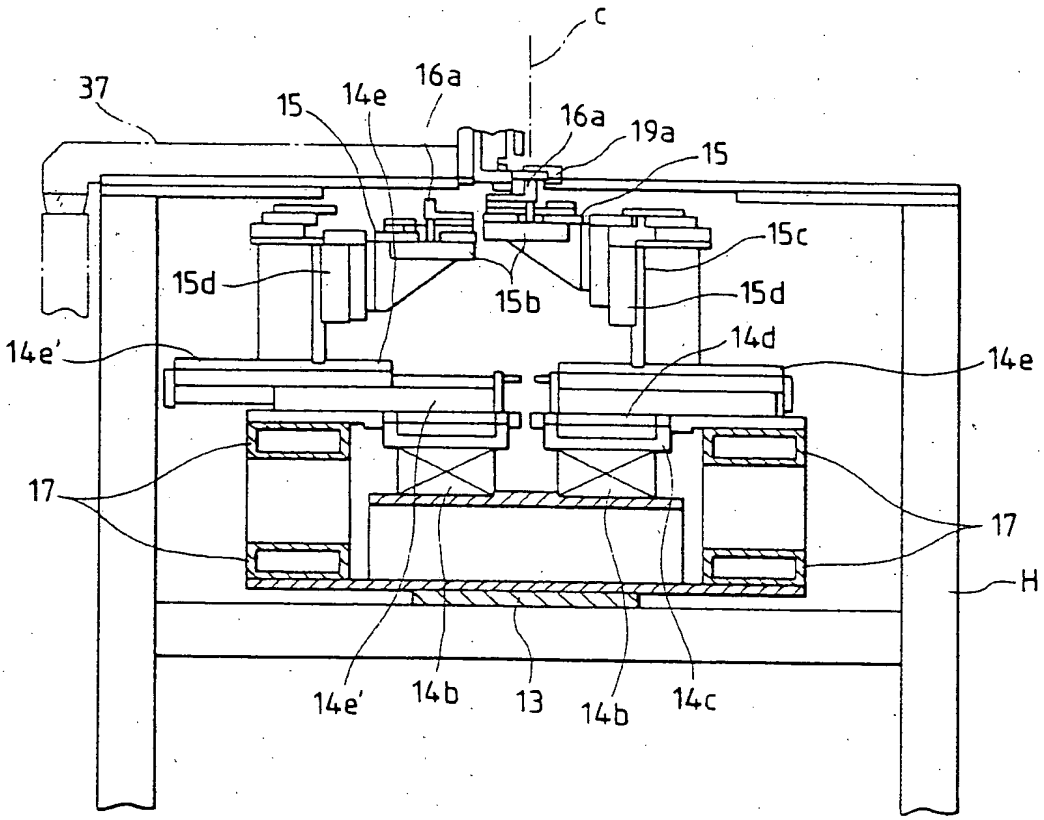
C
37
15
14e
16a
16a
19a
15
15c
15d
15b
15d
14e'
14d
14e
17
17
H
14e'
14b
13
14b
14c

FIG. 5

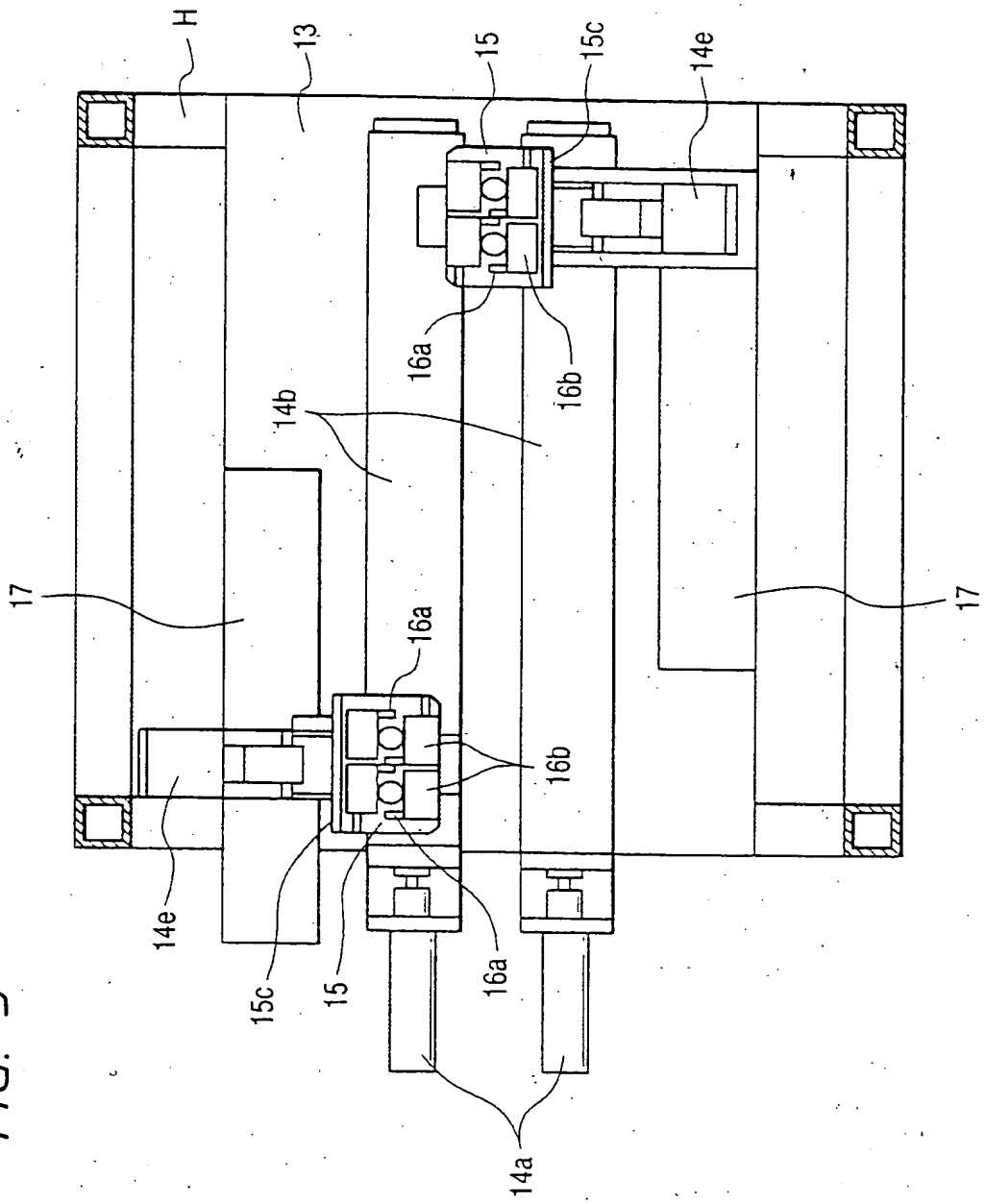

FIG. 6

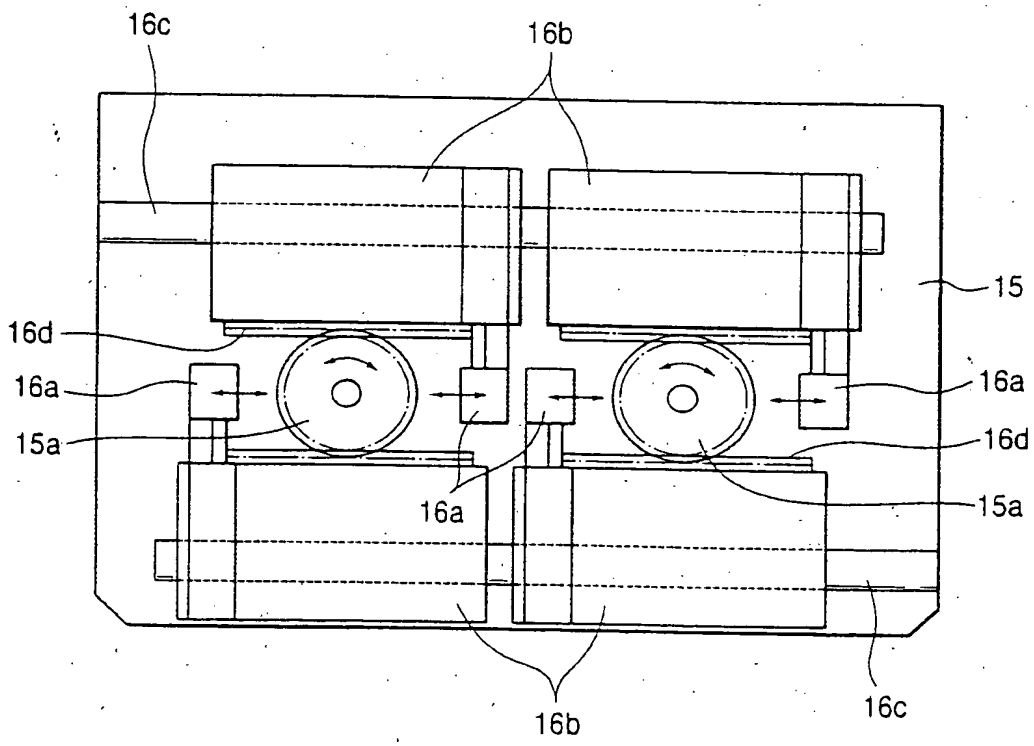

FIG. 7

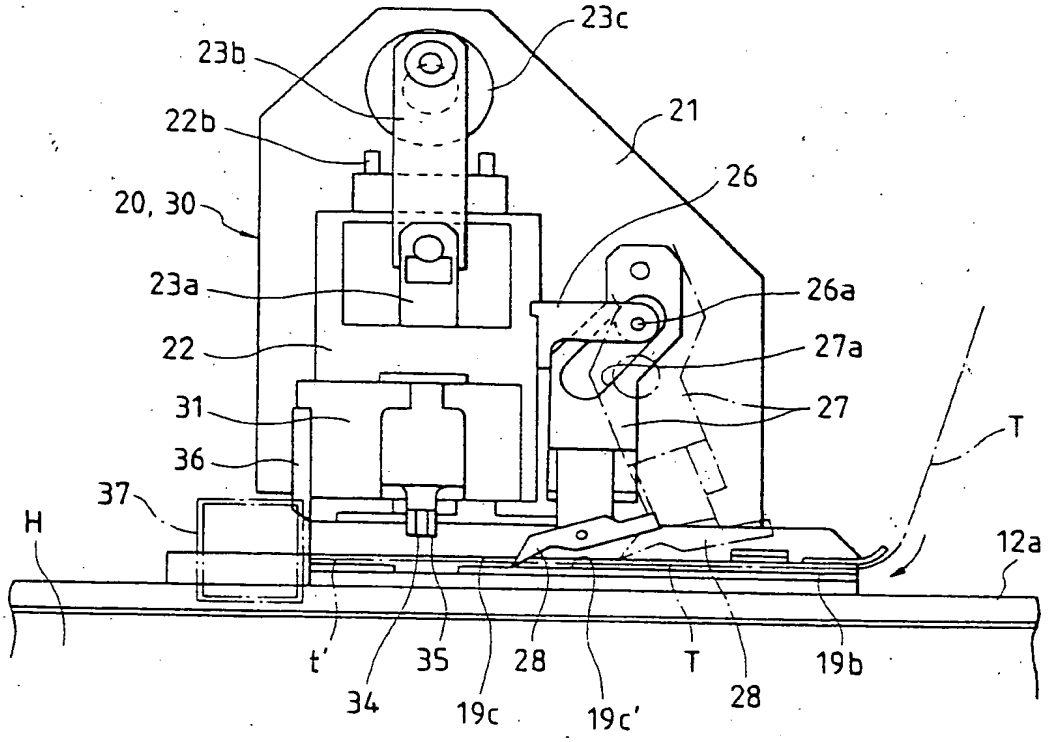
23c
23b
21
22b
26
20, 30
23a
26a
22
27a
31
27
T
36
37
H
12a
t'
35
28
T
19b
34
19c
19c'
28

FIG. 8

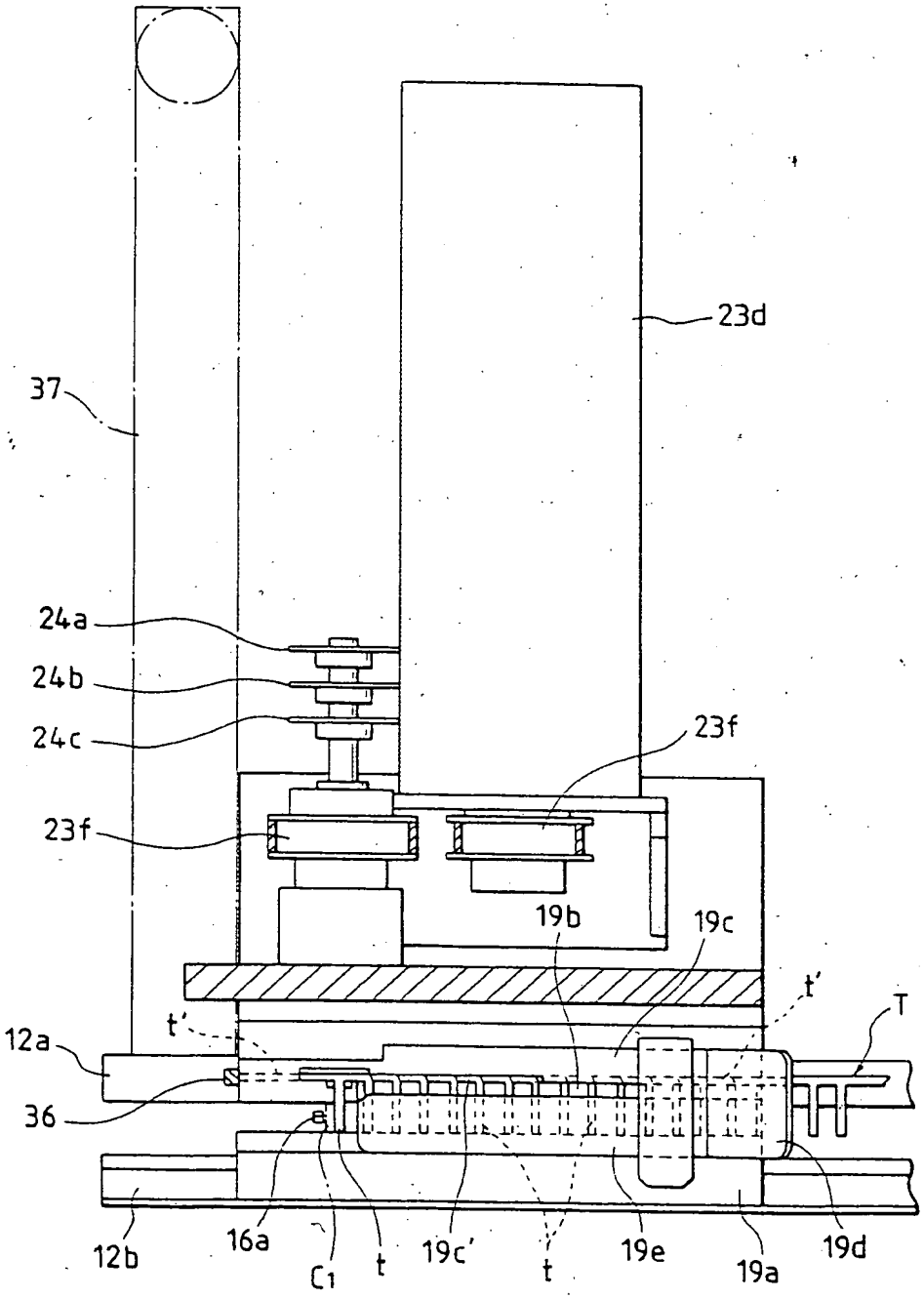
23d
37
24a
24b
24c
23f
23f
19b
19c
t'
t'
T
12a
36
12b
16a
C1
t
19c'
t
19e
19a
19d

FIG. 9

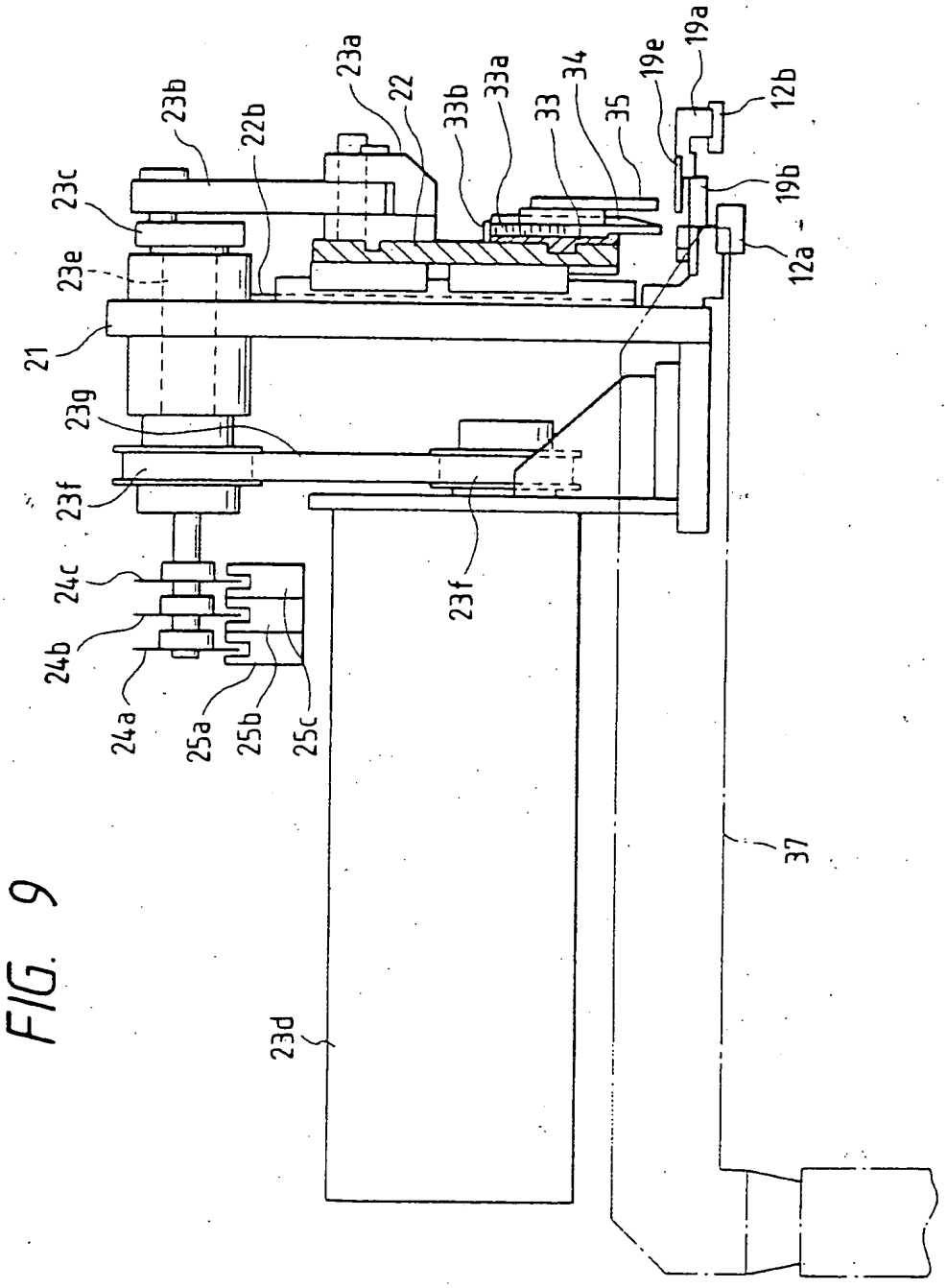
19a
12b
19e
35
34
33
33a
33b
22
23a
22b
23b
23c
19b
12a
23e
21
23g
23f
24c
24b
24a
25a
25b
25c
23f
37
23d

FIG. 10

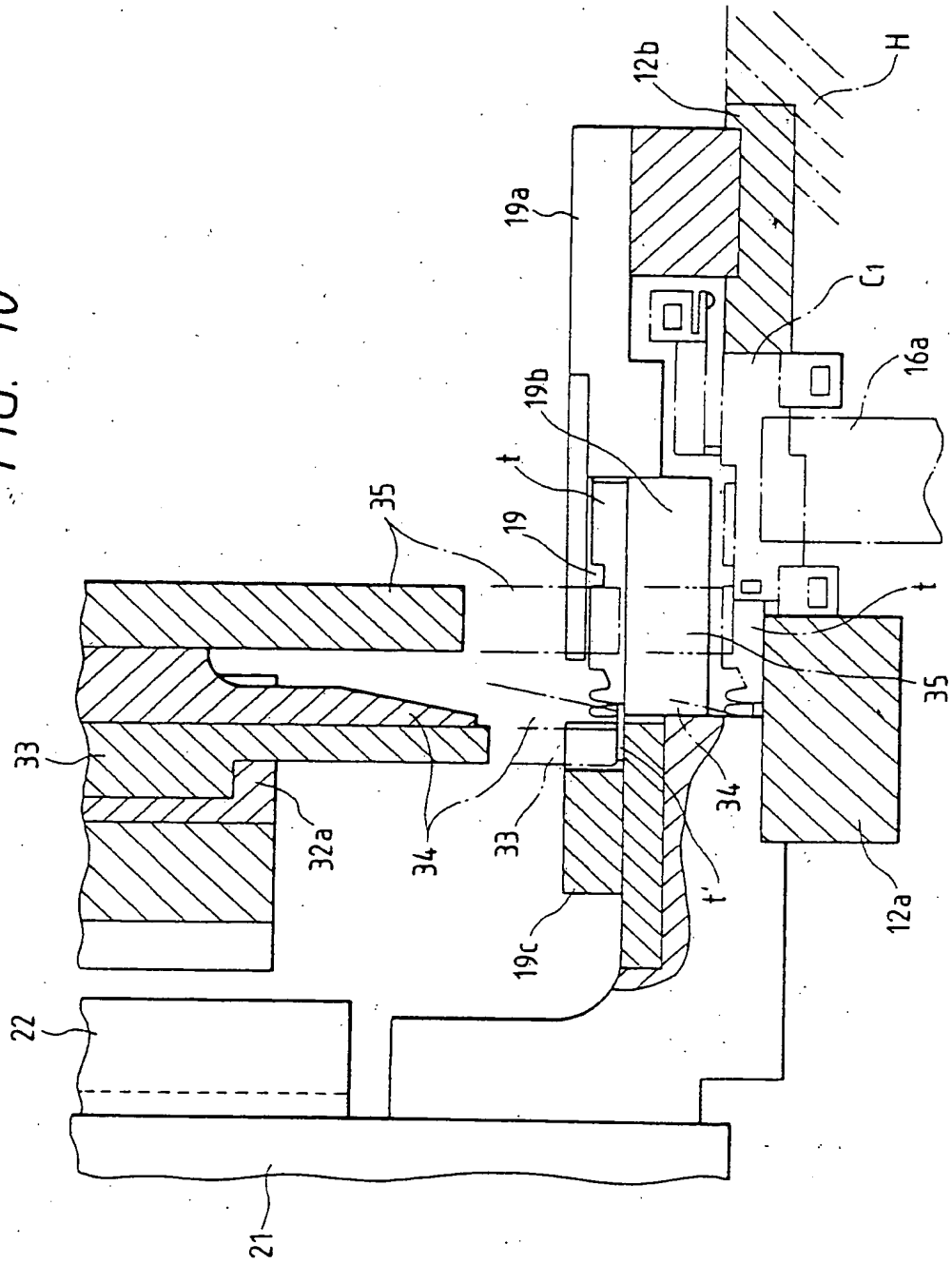

FIG. 11

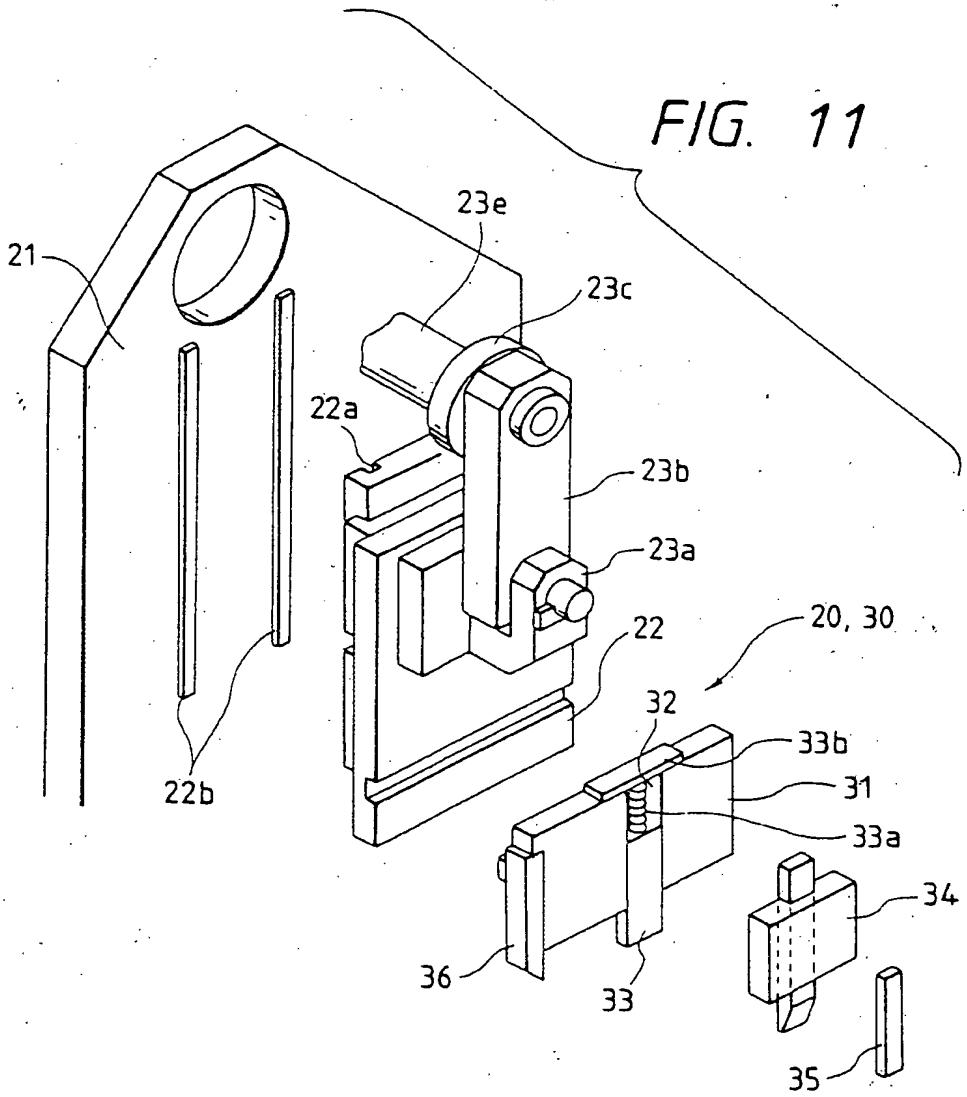

FIG. 12

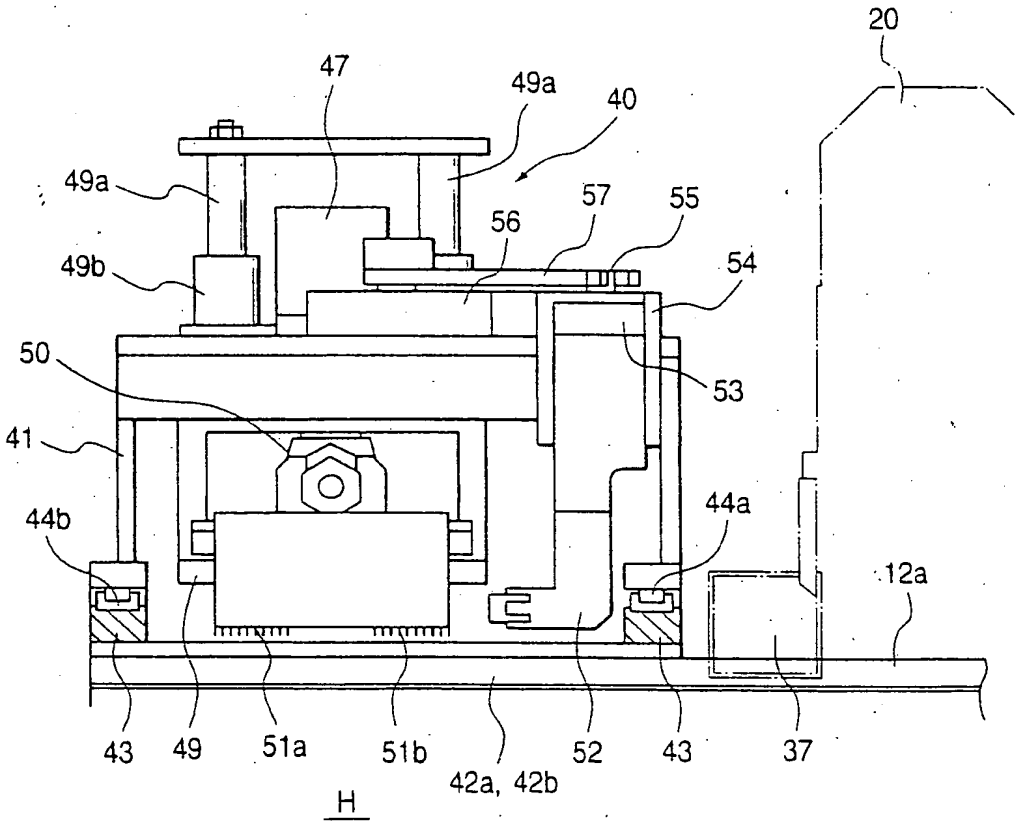
20
47
49a
40
49a
57
55
56
49b
54
50
53
41
44b
44a
12a
43
49
51a
51b
42a, 42b
52
43
37
H

FIG. 13

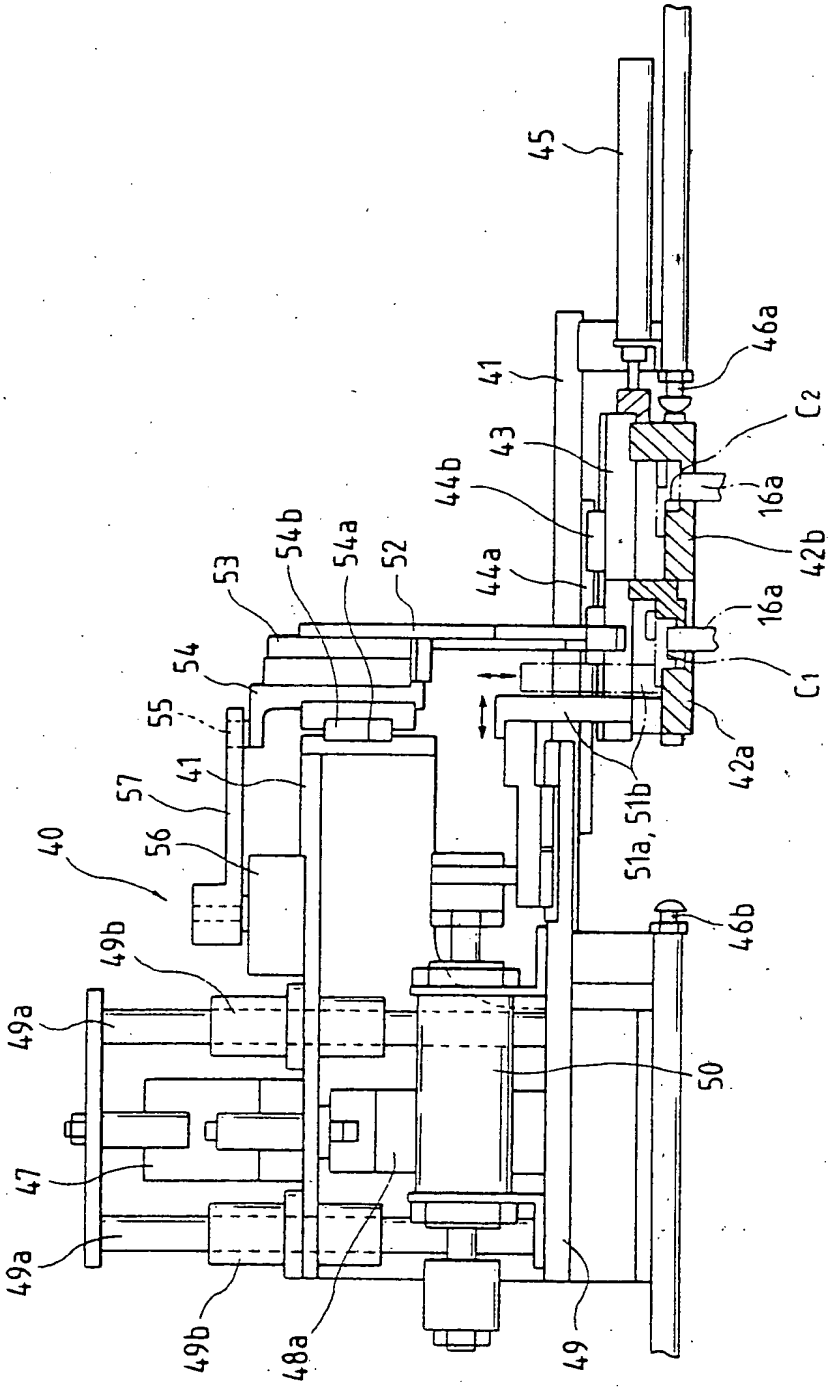
45
46a
41
C2
43
44b
16a
42b
53
54b
54a
52
44a
16a
54
C1
55
41
57
56
40
42a
51a, 51b
46b
49b
49a
50
47
49a
49b
48a
49

FIG. 14

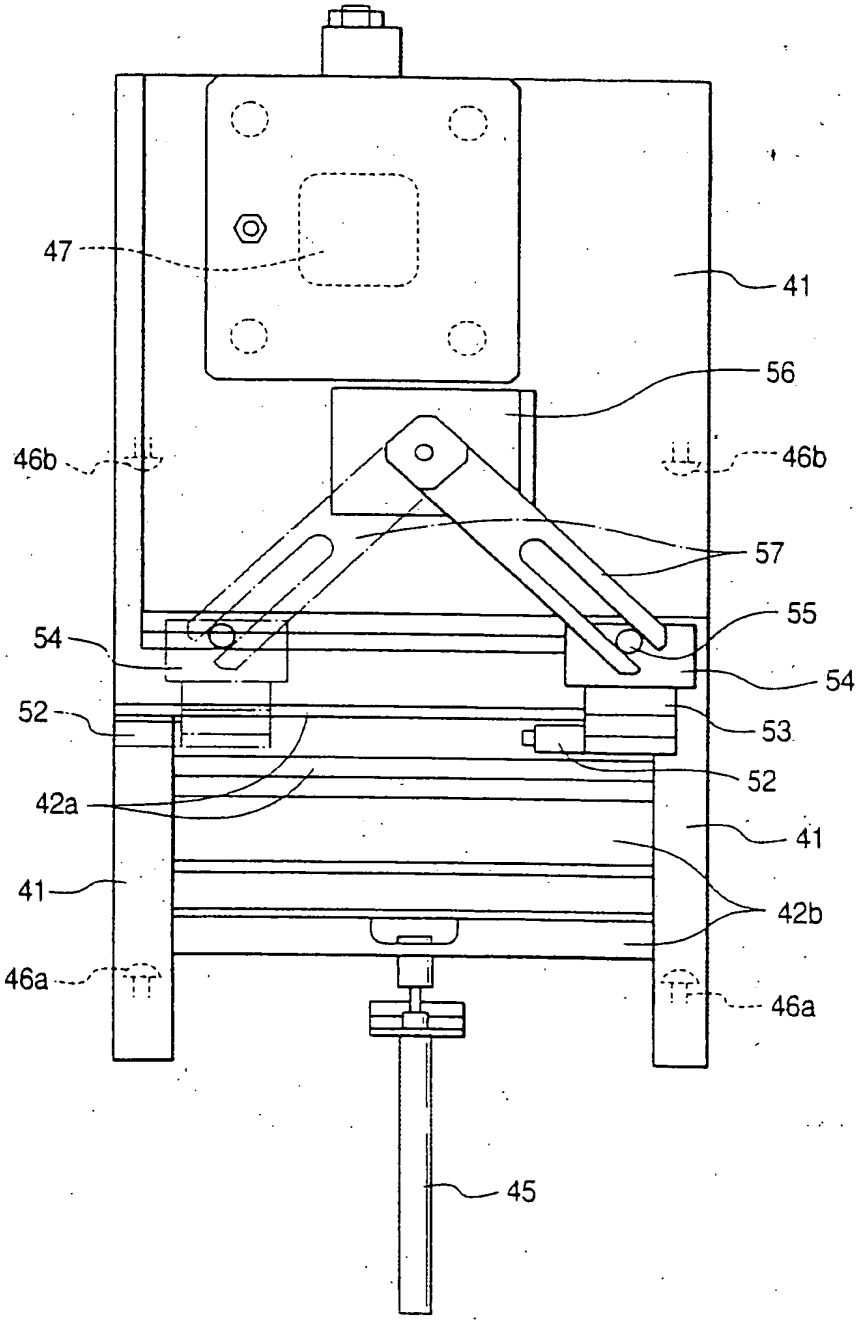

FIG. 15

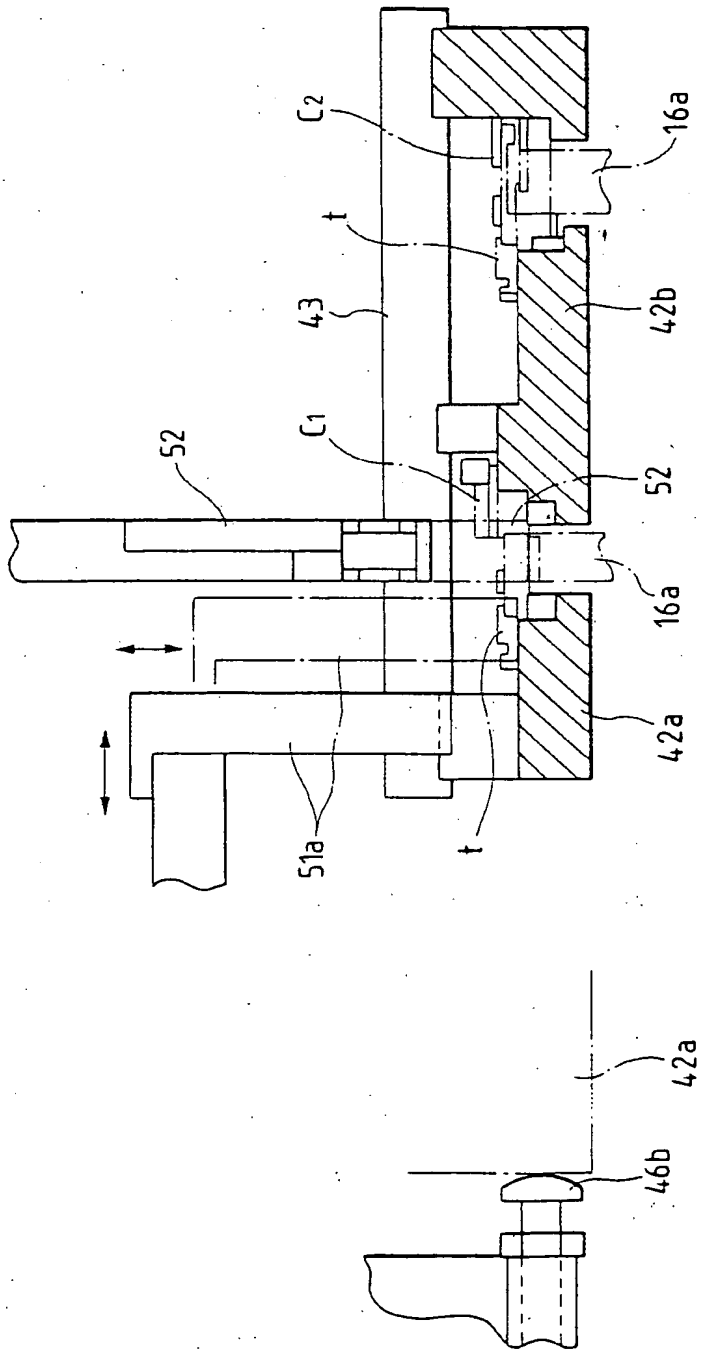

FIG. 16

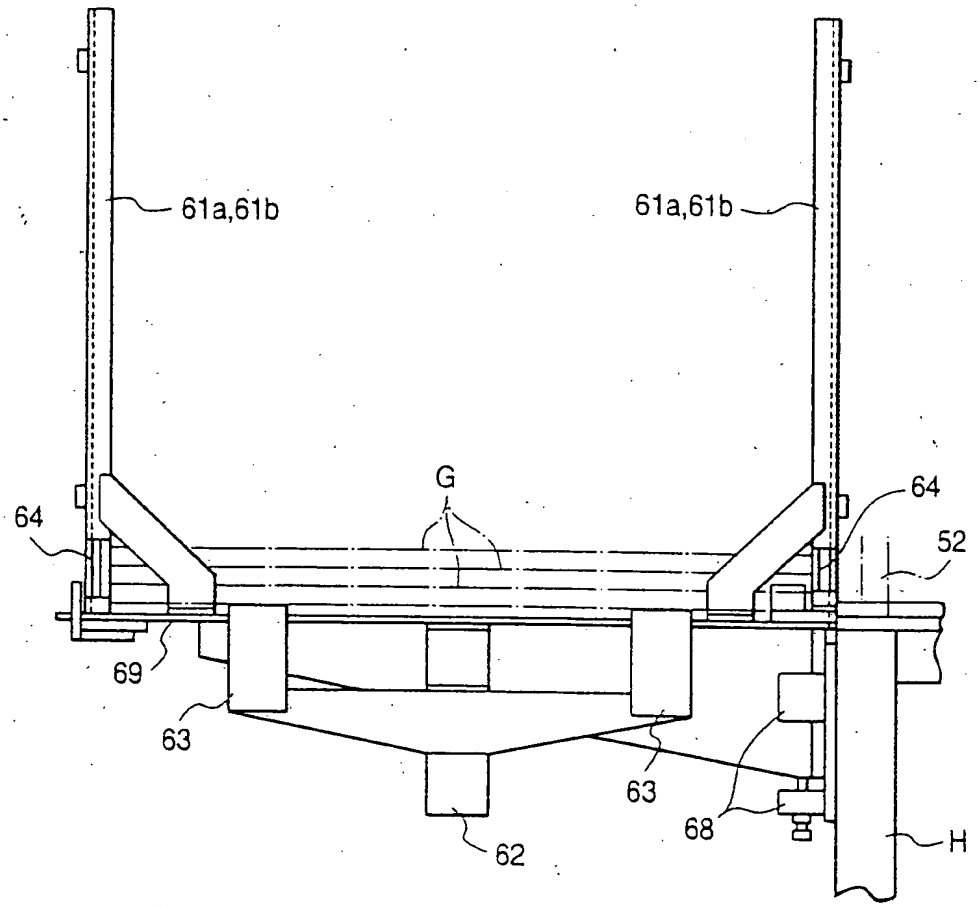

FIG. 17

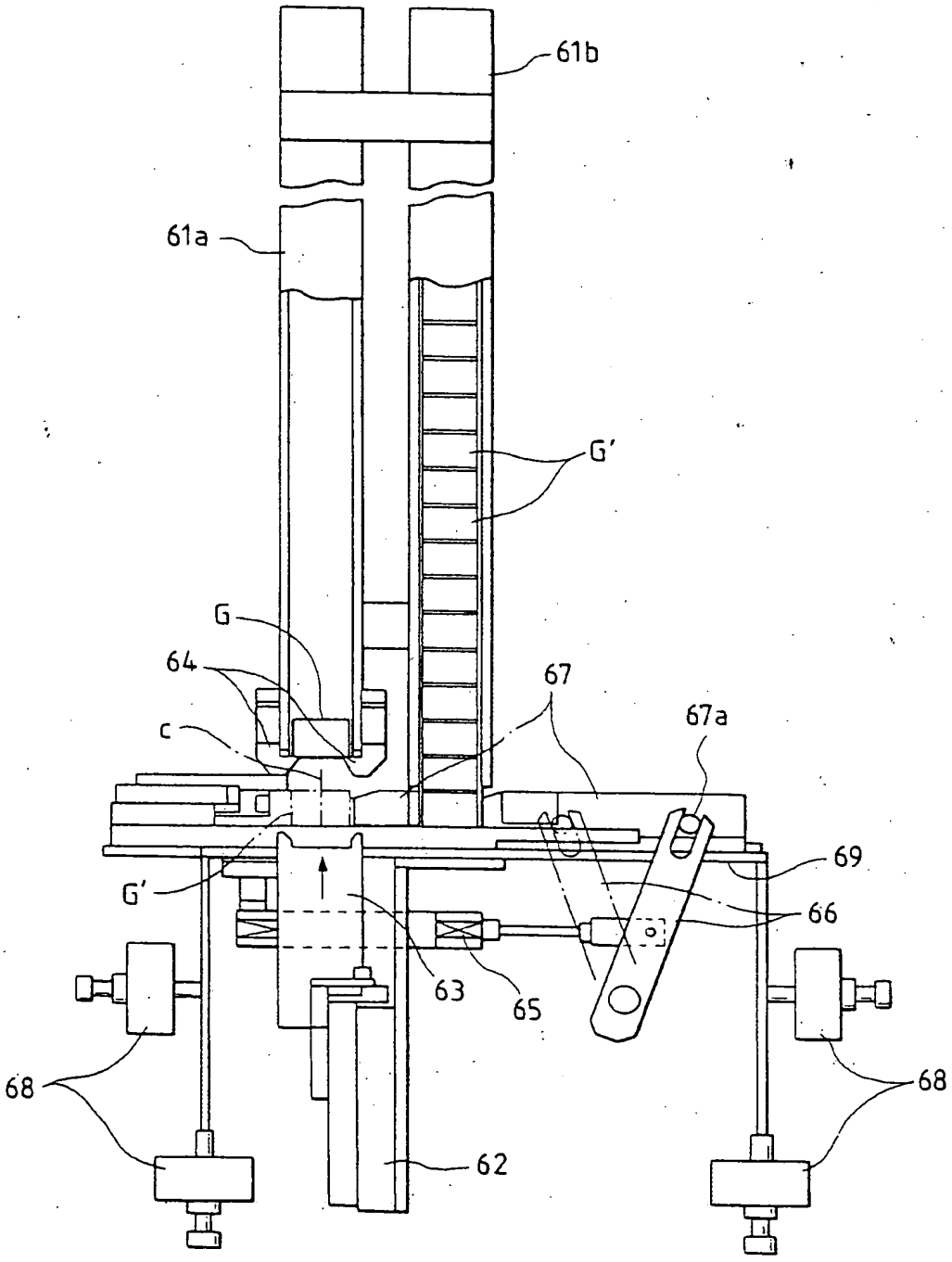

FIG. 18

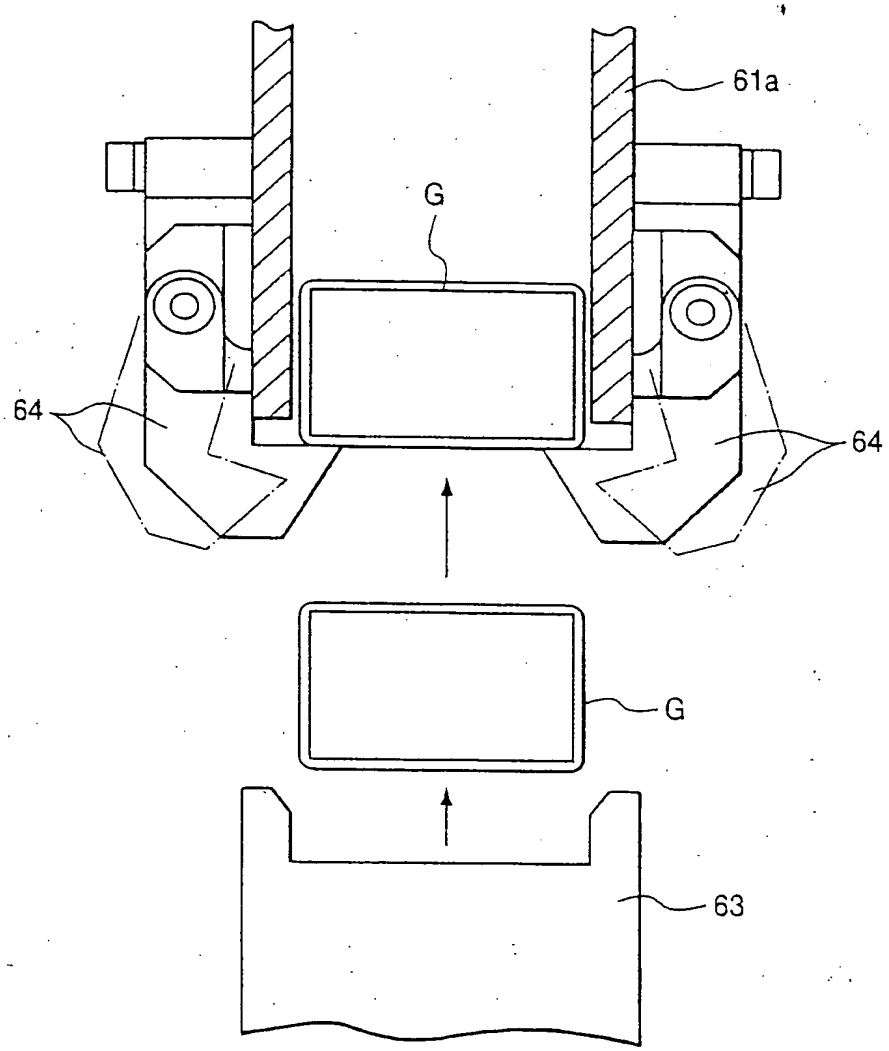

FIG. 19(a)

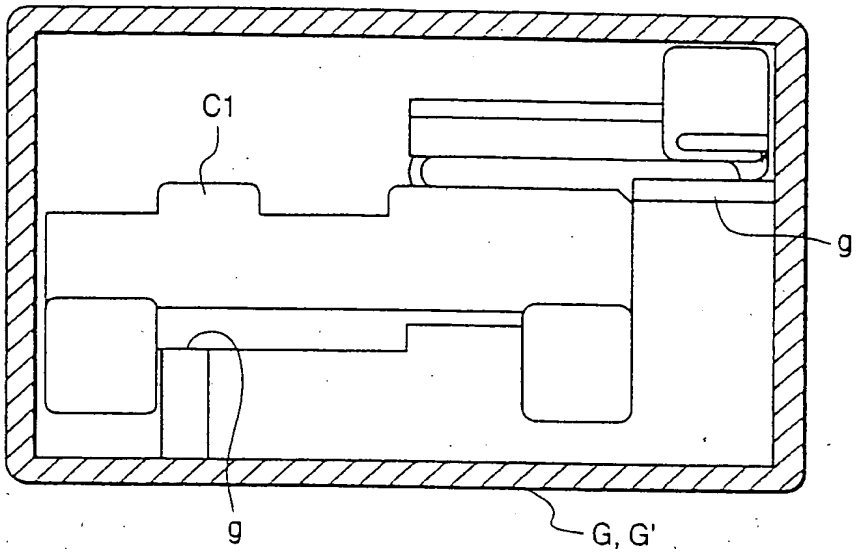

FIG. 19(b)

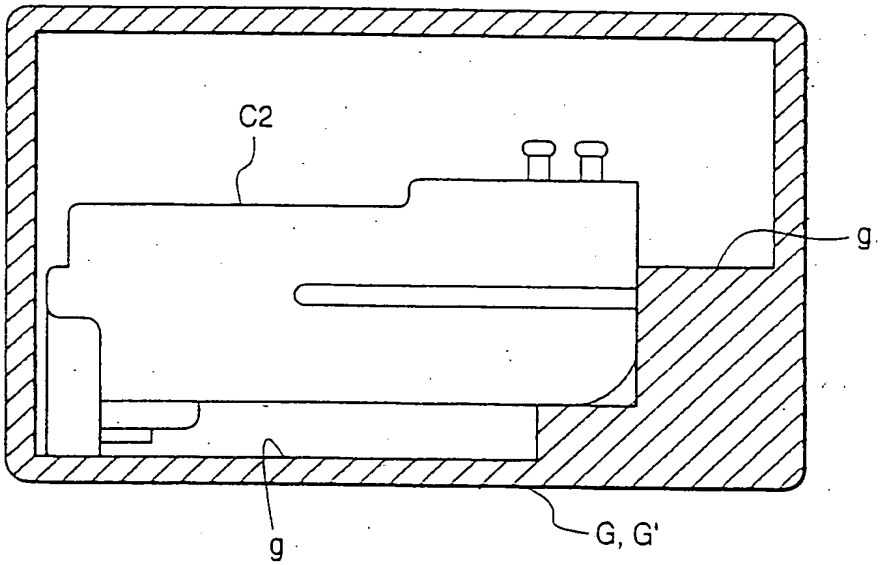

FIG. 20(a)

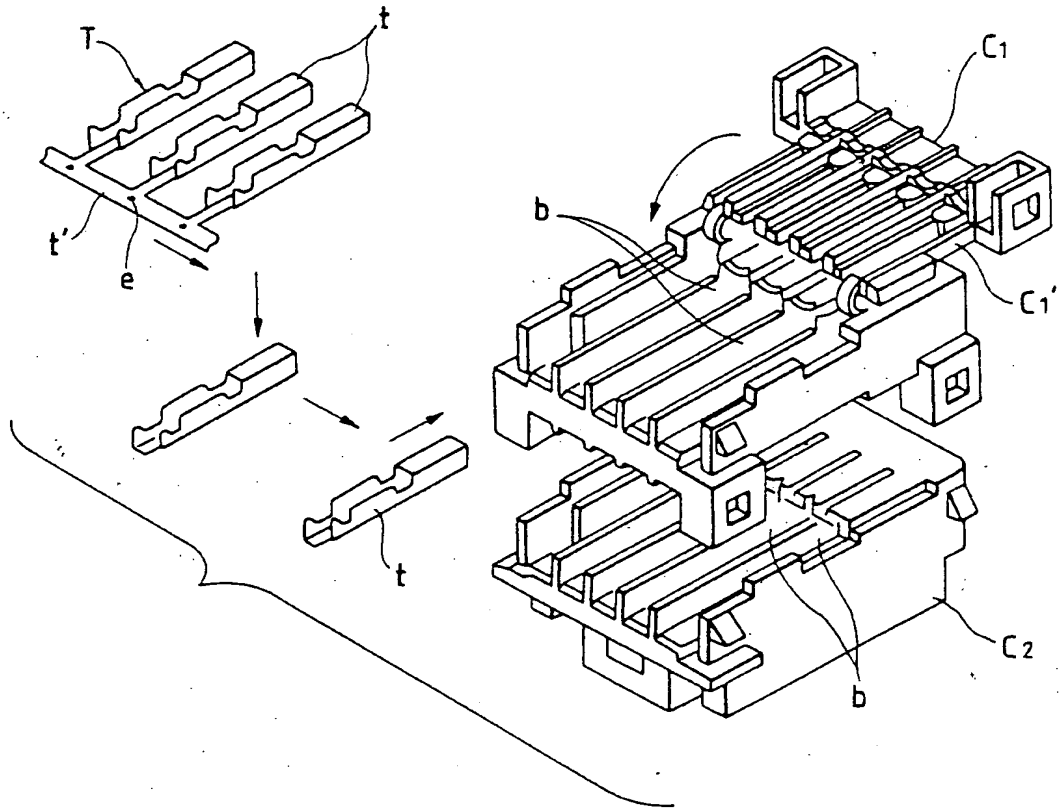

FIG. 20(b)